

ORIE 5380, CS 5727: Optimization Methods
Homework Assignment 6
Due November 1, 12:00 pm

(Make sure to submit one pdf file ready to print. If you handwrite your work, then use a scanner. Please do not submit a photo of your work.)

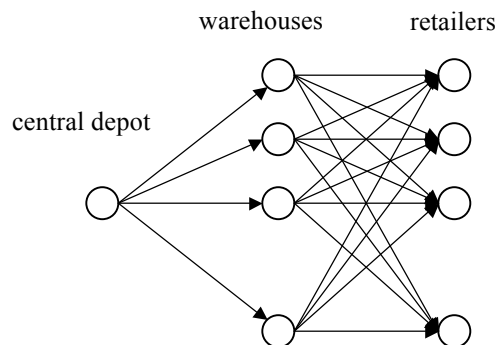
Question 1

In the attached text file, you will find data for a network. The first line in the file shows the number of nodes and the number of arcs in the network. Thus, there are a total of 8 nodes and 16 arcs. We label the nodes 1 through 8. Each line in the rest of the file corresponds to an arc. In each line, the first entry corresponds to the origin node of the arc. The second entry corresponds to the destination node of the arc. The third entry corresponds to the length/cost of the arc. Thus, the second line in the file corresponds to an arc from node 1 to node 2 with a length/cost of 1. The last line in the file corresponds to an arc from node 7 to node 8 with a length/cost of 6.

a) Write code in Python or in another programming language of your choice that calls Gurobi to find the shortest path from node 1 to node 8 in this network. Your code should read the data from the text file and use loops to create appropriate decision variables and constraints. It should solve the corresponding linear program, get the optimal solution and print the optimal solution and the optimal objective value, all in Python or in another programming language of your choice. Submit a printout of your code and the output from your code.

Question 2

The figure below shows the supply chain of a company, where the products at the central depot are shipped to one of the 10 warehouses. The demand at each of the 15 retailers is satisfied from the products shipped from the warehouses. There are 615 units of product available at the central depot. Due to shipment capacities, we can ship at most 10 units of product from each warehouse to each retailer. (In other words, there is an upper bound of 10 on the flow over the arc from each warehouse to each retailer.) In the attached text file, we have the data on the cost of shipping one unit from the central depot to each warehouse, the cost shipping one unit from each warehouse to each retailer, and the demand at each retailer.



a) Formulate a linear program that minimizes the total cost of shipping products from the central depot to the warehouses and from the warehouses to the retailers, so that the

product availability at the central depot is not violated and the demand at each retailer is satisfied. Clearly specify your decision variables. Write the objective function and constraints in compact form. You may need to devise some notation of your own for the shipment costs and the demands. (This part will be in paper and pencil.)

b) Write code in Python or in another programming language of your choice that calls Gurobi to solve the linear program that you formulated in Part b. Your code should read the data from the text file, but feel free to modify the layout of the text file to make it easier to read. You should use loops to create appropriate decision variables and constraints. Your code should solve the corresponding linear program, get the optimal solution and print the optimal solution and the optimal objective value. Submit a printout of your code and the output from your code.